

**SWAN LAKE
HABITAT REHABILITATION
AND ENHANCEMENT PROJECT**

**MANUAL FOR
OPERATION, MAINTENANCE, REPAIR,
REPLACEMENT AND REHABILITATION
(OMRR&R)**

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL #26, ILLINOIS RIVER, CALHOUN COUNTY
ILLINOIS



**US Army Corps
Of Engineers
St. Louis District**

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1. PROJECT GENERAL INFORMATION

1.01 PURPOSE OF THE MANUAL

This document has been developed to provide the sponsor, the U.S. Fish and Wildlife Service (USFWS), the necessary information, guidance and requirements for the operation, maintenance, repair, replacement, and rehabilitation of the Swan Lake Habitat Rehabilitation and Enhancement Project (HREP) located in Calhoun County, Illinois (hereinafter referred to as the "project"). This manual is to be used by the U. S. Fish and Wildlife Service (USFWS) personnel responsible for the maintenance and operation of the project.

The importance of proper maintenance during normal water stages and efficient operation of the habitat protection system during periods of high water stages cannot be overstressed. The failure of even a minor element of the system could jeopardize the overall effectiveness of the project. A thorough knowledge of requisite operation and maintenance procedures is, therefore, essential. Timely operation and maintenance of the various habitat control features will provide for proper regulation of water levels and sediment control within the project boundaries. This manual provides the essential general requirements for satisfactory operation and maintenance of the project features. Strict adherence to the guidance presented herein will insure maximum intended performance for habitat protection during the life of the project.

This manual is intended to supplement the Memorandum of Agreement (MOA) between the U.S. Fish and Wildlife Service (USFWS) and the U.S. Army Corps of Engineers (USACE). See appendix A for a copy of the MOA. This manual provides the general standards of operation and maintenance, as well as establishes an initial frequency of management responsibilities to ensure satisfactory project performance.

1.02 PROJECT LOCATION AND DESCRIPTION

General. The Swan Lake HREP, see Figure 1-Project Map, is located in Calhoun County, Illinois, along the west bank of the Illinois River, between river miles 5 and 13 near the confluence with the Mississippi River. The 4,600-acre project area includes 2,900-acre Swan Lake, 200-acre Fuller Lake, and approximately 950 acres of bottomland forest and 550 acres of agricultural land around the lake is a major component in the Mark Twain National Wildlife Refuge. Also included in the project area is the local watershed adjacent to Swan Lake's west shore. Swan Lake serves as an integral habitat for a variety of floodplain organisms, especially migratory birds and riverine fish. On a national scale, Swan Lake provides a vital connectivity link for the seasonal movements of numerous migratory bird species along the Mississippi River flyway. The project is essential for the successful reproduction, rearing and over-wintering of many riverine fish species, and provides critical habitat from harsh winter conditions in the main river channel.

Management of the project area is divided. Fuller Lake and the uppermost 300 acres of Swan Lake are managed by the Illinois Department of Conservation (IDOC) for the U.S. Fish and Wildlife Service (USFWS). The remaining 2,600 acres of Swan Lake are managed directly by the USFWS as part of the Mark Twain National Wildlife Refuge.

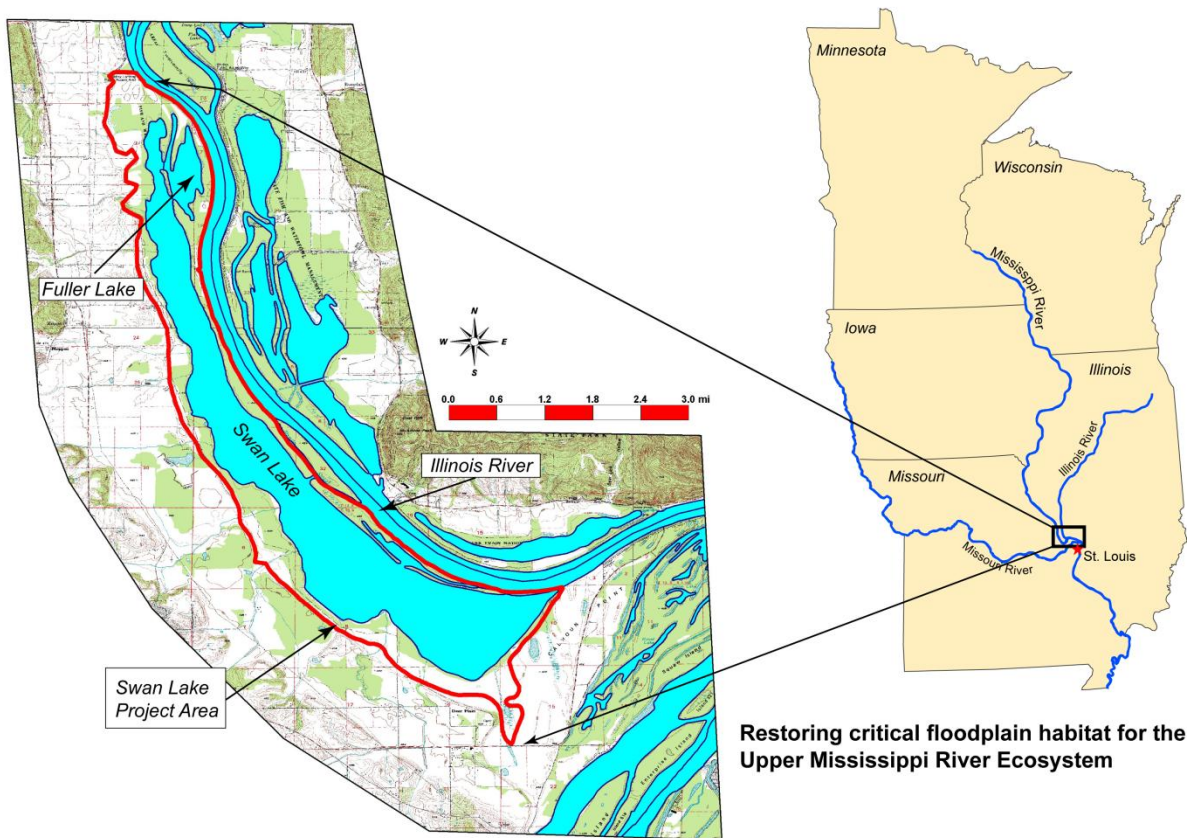
IDOC, through a separate agreement with the USFWS, is the local sponsor for the upper Swan/Fuller Lake area; the USFWS is the sponsor for middle and lower Swan Lake areas.

2. PROJECT AUTHORIZATION

The project was developed through the Upper Mississippi River System - Environmental Management Program (UMRS-EMP). The authority for this project was provided by the Supplemental Appropriations Act (Public Law 99-88), Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662) and Section 107(b) of the Water Resources Development Act of 1992 (Public Law 102-580). The project was funded and constructed under this authorization by the U.S. Army Corps of Engineers (USACE), St. Louis District, in cooperation with the U.S. Fish and Wildlife Service (USFWS).

3. PROJECT PERFORMANCE

The Project Performance Evaluation Monitoring Plan, as identified in the DPR, (including physical and chemical analyses) was developed for pre-construction, construction and post-construction monitoring that complies with the scope and methodologies used for other HREP's, and the Upper Mississippi River System –Long Term Resource Monitoring Program (UMRS-LTRM), has been developed. The project's compartmentalization provides a unique opportunity to experimentally ascertain the relative fish and waterfowl benefits of various design features and water level management regimes. Changes that would be evaluated include, fish community and population structure, lake/river fish movement, overwintering habitat use, waterfowl presence and abundance, vegetation and invertebrate composition, biomass and production. Performance monitoring is considered necessary to properly evaluate effects of the constructed project features.



Swan Lake Ecosystem Restoration Project

Figure 1 - Project Map

4. PROJECT FEATURES

The following features were constructed to provide the most habitat benefits and cost efficiencies to achieve the goals and objectives of the project, see Figure 2:

Island Building (Middle / Lower Swan Lake) – Dredge lake sediments to construct groups of barrier islands that would reduce wind-generated wave action and reduce turbidity levels within Swan Lake

Channels (Middle/Lower Swan Lake) – Channels were constructed to subdivide the Swan Lake into independently managed, but complimentary habitat compartments and to help convey water from water control structures.

Overwintering Habitat Dredge Cut (Middle/Lower Swan Lake)/Dredging - Dredging to provide deep water fish habitat was accomplished in conjunction with the construction of the riverside levee. Borrow material for levee construction was taken from the lake bottom immediately adjacent to the levee. This created 5.9 miles of deep water habitat that was approximately 30 feet wide by 10 feet deep.

Riverside levee to retard the deposition of river borne sediment. The riverside levee is an 8.8-mile earthen levee that parallels the Illinois River shoreline and the perimeter of the Refuge. The levee was necessary to reduce siltation that occurs from frequent floods from the Illinois River and to improve water control capabilities. Two spillways were created on the levee by lowering the elevation of the levee and adding stone protection. These spillways allow for overtopping to happen in a controlled manner without causing damage to the levee.

Water and sediment control basins and ponds to trap hillside sediments - Erosion control practices were implemented at more than forty sites in the Swan Lake Watershed by the end of 1998. This included 25 water and sediment control basins (WASCOB) in upland watersheds to reduce sediment transported by tributaries flowing into the lake.

Gravity structure to separate Swan Lake from the Illinois River, allowing for fish passage. Gravity structures were constructed at the southern end of Lower Swan Lake (river mile 5.0) and at the upper end of Middle Swan Lake (river mile 9.8) to separate Swan Lake from the Illinois River while still allowing for fish passage. The structures consist of a 20-foot wide open concrete channel containing four 52-inch wide stoplog slots.

36” gravity drain at the Upper Swan Lake site for the compartmentalized control of interior water levels between Upper and Middle Swan Lake.

Water level control features (including gravity drains, interior closure structures, and pump stations) to provide for interior water level control. Basic data on water level control features follows:

- A. Upper Swan Lake to Illinois River. A 48-inch and 60-inch gated CMP drains this unit to the Illinois River and a 16,000 GPM reversible pump station facilitates watering and dewatering. The pump station consists of a precast concrete vault with two bays. One bay is the sump for the 16,000 GPM vertical, line-shaft pumps. The pump discharges through a flap gate into the other bay which serves as the pump discharge chamber. Corrugated steel pipes extend from the sump and discharge chamber, through the levee to Fuller Lake and to the Illinois River. The pump station can pump from Fuller Lake into the Illinois River or from the Illinois River into Fuller Lake. Pumping direction is controlled by opening or closing the two pump sump intake gates and the two discharge chamber outflow gates. The pump is driven by a diesel engine through a universal drive shaft, belt drive and a right angle gear reducer. The diesel engine is trailer mounted so it can be stored off-site when not in use. The diesel fuel tank is also trailer mounted. The pump intake sluice gates are two 60-inch x 60-inch self contained Hydro Gate sluice gates. The discharge chamber gates are two 48-inch x 48-inch self contained Hydro Gate sluice gates. The sluice gates are manually operated using the hand crank or using a portable hydraulic operator. A 24" CMP with a sluice gate drains water near the north end of Upper Swan Lake into the Illinois River.
- B. Middle Swan Lake to Illinois River. A 72-inch gated CMP drains this unit to the Illinois River and a 30,000 GPM reversible pump station facilitates watering and dewatering. It is located near the upper end of the compartment at RM 9.8. The pump station consists of a precast concrete vault with two bays. One bay is the sump for the 30,000 GPM vertical, line-shaft pump. The pump discharges through a flap gate into the other bay which serves as the pump discharge chamber. Corrugated steel pipes extend from the sump and discharge chamber, through the levee to Middle Swan Lake and to the Illinois River. The pump station can pump from Middle Swan Lake into the Illinois River or from the Illinois River into Middle Swan Lake. Pumping direction is controlled by opening or closing the two pump sump intake gates and the two discharge chamber outflow gates. The pump is driven by a diesel engine, rated for 118 hp at 1800 rpm, through a universal drive shaft and a right angle gear reducer. The diesel engine is trailer mounted so it can be stored off-site when not in use. The diesel fuel tank is also trailer mounted. The pump intake sluice gates are two 84-inch x 84-inch self contained Hydro Gate sluice gates. The discharge chamber gates are two 72-inch x 72-inch self contained Hydro Gate sluice gates. The sluice gates are manually operated using the hand crank or using a

portable hydraulic operator. The 72-inch gated CMP at the pump station discharge chamber can serve as a gravity drain when the pumping station is not in operation.

- C. Middle Swan Lake to Lower Swan Lake. Through the interior lake closure between Lower Swan and Middle Swan Lake is a 42 inch gated CMP to release water from Middle Swan into Lower Swan. The drainage structure consists of a 42-inch diameter Waterman Industries, Inc. C-20-SB-Y canal gate mounted on the 42-inch CMP inside a 72-inch diameter riser pipe.

- D. Lower Swan Lake to Illinois River. An angle mounted pump is installed in the unit for dewatering. The pumping capacity is 48,000 gpm at a total dynamic head of 16.2 ft and 50,000 gpm at a total dynamic head of 7.63 ft. The pump is driven by a diesel engine, rated for 301 hp at 1800 rpm, through a universal drive shaft, belt drive and a right angle gear reducer. The diesel engine is trailer mounted so it can be stored off-site when not in use, the diesel fuel tank is also trailer mounted. There is a water control structure at the inlet to the Lower Swan Lake pumping station with five sluice gates and 5 fish screens. The structure helps keep silt out of the pump sump area when the pump is not being operated. A portable diesel engine driven pump is also provided. The pumping capacity of the portable pump is 3100 gpm at a total dynamic head of 40 ft.

- E. Boat Ramps were constructed to provide service access to constructed features to better facilitate operation and maintenance of the constructed features.

5. PROJECT CONSTRUCTION HISTORY

The project was constructed under the following six construction contracts. Details of the work done in the contracts can be found in Appendix B.

1. Swan Lake Habitat Rehabilitation and Enhancement Project - Item I. Item I consisted of riverside levee construction from sta. 346+12.52 to sta. 485+20.00, site grading, and the installation of a gated 24-inch diameter corrugated steel pipe.

2. Swan Lake Habitat Rehabilitation and Enhancement Project – Pumping Station Item II. Item 2 consisted of construction of Upper Swan Lake pump station (sta. 353+00), Middle Swan Lake pump station at (sta. 285+30), a gravity structure at sta. 287+07.93 and a gravity structure sta. 21+55.55

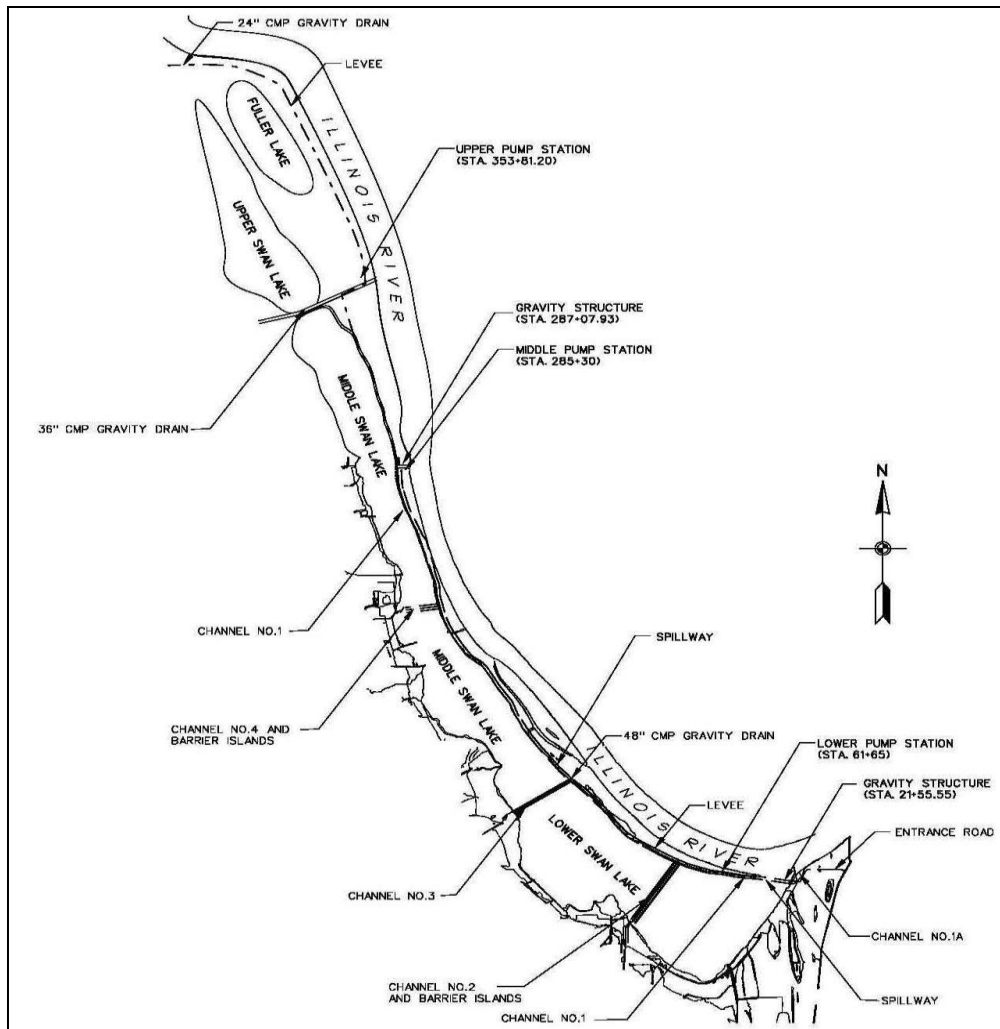
3. Swan Lake Habitat Rehabilitation and Enhancement Project –Item III. Item 3 consisted of construction of riverside levee from sta. 102+00 to sta.

334+37.95, barrier islands, channels No. 1,2,3, and 4, upper and lower boat ramps, and a 42-inch gravity drain (referred to as interior closure structure in the as-built plans).

4. Swan Lake Lower Compartment Pump Station. This contract consisted of construction of Lower Swan Lake pump station (sta. 61+65).
5. Swan Lake Lower Compartment Pump Station Modification. This contract consisted of changes to the original contract for the Lower Swan Lake pump station (sta. 61+65). This contract provided a gated structure at the inlet to the Lower Swan Lake pumping station with five sluice gates and 5 fish screens. The structure helps keep silt out of the pump sump area when the pump is not being operated. A portable diesel engine driven pump is also provided.
6. Swan Lake Levee Repairs. The levee repairs consisted of fixing low spots in the levee crown to match the design height as specified in construction plans.

Figure

2 -



Project Features

6. PROJECT OPERATION PLAN

The Swan Lake project will require ongoing water resource management in order to maintain an optimum fish and wildlife habitat. The sponsor is responsible for the administration, operation, maintenance, and repair of the project in accordance with the existing MOA, the DPR, and this supplement. The sponsor shall maintain books, records, and accounting of all funds expended on the project within a mutually accepted accounting procedure. The sponsor shall incorporate all necessary information concerning the operation, maintenance and repair of the Project into its Annual Management Plan. The sponsor shall be required to fulfill all operation, maintenance, repair and rehabilitation tasks for each feature as described elsewhere in this manual. Manufacturers' operation and maintenance manuals referenced below are located on the CD furnished as part of this manual.

6.01 LEVEES

Operation requirements for the Riverside (Exterior) Levee and the Interior Levees are as follows:

1. After flood periods the levees shall be inspected to verify an acceptable condition as defined by the following conditions:
 - A. There are no indications of slides or sloughs developing.
 - B. Wave wash or scouring action is not occurring.
 - C. No low reaches of levee exist which may be overtopped sooner than planned.
 - D. Debris is removed from levee slopes.
 - E. No other conditions exist which might endanger the levees.
2. Appropriate advanced measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition, which endangers the levee, and to repair the damaged section.
3. Except for those measures described above, no other special procedures are required to operate the levee system.

6.02 WATER CONTROL STRUCTURES

Specific operation requirements shall be performed as determined by the USFWS Site Manager. The source of water for the Water Management Units (WMUs) is the Illinois River. The operation and management of all water control structures should be coordinated with the water management plan for the project.

1. 42-inch Gravity Drain. This item was provided in Swan Lake Item III contract. Operation instructions and detail drawings for the 42-inch drainage structure canal gate and hand-crank hoist are noted in the Waterman Operation and Maintenance Manual for: Canal Gate for: Swan Lake Item III, located on the CD furnished with this manual. The gate is a 42-inch diameter Waterman Model C-20-SB-Y canal gate. **Prior to operation, thoroughly clean operator stem threads and lubricate in accordance with stem installation instructions. Grease fittings on the operator should be lubricated with a small amount of heavy duty grease at least 3 times a year. (See Waterman Operation and Maintenance Manual for maintenance of manual gate operators). Do not apply excessive force to the operator when closing the gate. This could buckle (bow) the stem and/or damage gate components.**
2. 24-inch Gravity Drain. A 24-inch diameter corrugated steel pipe with a sluice gate was provided under Swan Lake Item I contract. The handwheel-operated 24-inch gate is a medium duty, self-contained, model 20-10C sluice gate manufactured by Hydro Gate. The gate has a spigot back seat for mounting on a corrugated steel pipe. The gate is designed for a 20 foot seating head and a 10 foot unseating head. The gate has a stainless steel operating stem. Failure to maintain stem thread lubrication causes operating difficulty and premature failure of lift nut and stem threads. **Prior to operation, thoroughly clean operator stem threads and lubricate in accordance with stem installation instructions. Do not over-open the gate. Serious damage to the gate stem and sealing surfaces can result. Do not apply excessive force to the operator when closing the gate. This could buckle the stem and/or damage gate components.**

6.03 PUMPING STATIONS

Specific operation requirements will be performed as determined by the USFWS Site Manager. The pumps must be activated manually to fill or empty the Water Management Units (WMUs). The pumps must also be deactivated manually once the desired water elevations are achieved in the WMUs. **NOTE: IT IS VERY IMPORTANT TO NOT OPERATE PUMPS BELOW THE MINIMUM PUMPING WATER LEVELS – SERIOUS DAMAGE COULD RESULT.**

PUMP DATA

Pump Station	No. of Pumps	Capacity (gpm)	Design Pumping Water Level	Minimum Pumping Water Level
Upper	1	16,000	EL 419'	EL 416.7'
Middle	1	30,000	EL 419'	EL 416.7'
Lower	1	48,000	EL 416.0'	EL 414.0'

1. **Upper Pumping Station (Sta. 353+81.20)**. This pumping station will be operated by IDNR and is used to pump from the Illinois River into Fuller Lake or to pump from Fuller Lake into the Mississippi.

A. **Prestart Check List**. The following steps shall be performed before starting the pump. See manufacturers' operation manuals for details.

- i. Check the intake water level for required submergence.
- ii. Open one sump intake sluice gate and open one discharge chamber outlet sluice gate. Close the two other sluice gates.
- iii. Check the sump for debris, which might restrict the pump intake.
- iv. Check the diesel engine for proper fluid levels and lubricants.
- v. Lubricate the jackshaft assembly.
- vi. Lubricate the PTO and the driveshaft.
- vii. Lubricate all bearings on the pump and gear reducer. If the pump has been idle for several months, the pump oil reservoir should be drained and refilled. Do not fill pump oil reservoir to the top. Make sure to leave ½-inch to 1-inch of air space in the oil reservoir.
- viii. Check the reducer lubricant level and fill as needed.
- ix. Open the air valve on the gear reducer.
- x. Install the drive belts and belt guard.
- xi. Connect the driveshaft and jack shaft.
- xii. Check that all rotating machinery guards are properly attached.

xiii. Follow engine/pump start-up instructions for warm-up.

B. Normal Start-up. *Operation during ice conditions should be avoided. The pump should be throttled down and shut off when cavitation is detected, until the cause can be determined and corrected.* The following steps should be performed at system start-up:

- i. Thoroughly review and follow the manufacturer's operating instructions for the diesel engine.
- ii. Connect quick disconnect fuel lines to the supply and return connections of the diesel engine and on the trailer mounted fuel tank. Open valves on supply and return lines.
- iii. Start engine with clutch disengaged.
- iv. Allow engine to warm up at idle, as recommended in the engine manufacturer's instructions.
- v. Adjust engine speed to 800 revolutions per minute (rpm).
- vi. Partially engage clutch and release while observing for smooth operation, drive shaft alignment, belt alignment, belt tension and any noisy operation. Repeat this step several times for brief periods to verify proper connection of prime driver to system.
- vii. After verification of connection, engage clutch fully at 800 rpm, then gradually increase speed on the engine to normal operating speed of approximately 1800 rpm.
- viii. **NOTE: During initial break-in period of belt drive operation, the drive belts require frequent adjustment.**

C. Normal Shutdown. The following steps should be performed at shut-down:

- i. Thoroughly review and follow the manufacturer's operating instructions for the diesel engine.
- ii. Gradually reduce engine speed to approximately 800 rpm.
- iii. Allow engine to run at 800 rpm for two to three minutes to empty the pump discharge piping of water.
- iv. Disengage the clutch. (As the pump assembly comes to a stop, some water may backflow through the pump. This is normal, but

the non- reverse ratchet on the gear drive should prevent reverse rotation of the pump impeller.)

- v. Allow engine to cool down by running at 800 rpm with no load for 4-5 minutes.
- vi. Shut down the engine.
- vii. Close fuel line supply and return valves before disconnecting hoses.
- viii. Close the air valve on the gear reducer.
- ix. Close the sump intake sluice gate.
- x. Disconnect drive shaft from engine and from jack shaft.
- xi. Remove belt guard and drive belts,
- xii. Check all equipment for damage or excessive wear.
- xiii. Service the diesel engine off-site after each operation, in accordance with the engine manufacturer's instructions.

2. **Middle Pumping Station (Sta. 285+30.18).** This pumping station will be operated by USFWS and is used to pump from the Illinois River into Middle Swan Lake or to pump from Middle Swan Lake into the Illinois River.

A. **Prestart Check List.** The following steps shall be performed before starting the pump. See manufacturers' operation manuals for details.

- i. Check the intake water level for required submergence.
- ii. Open one sump intake sluice gate and open one discharge chamber outlet sluice gate. Close the two other sluice gates.
- iii. Check the sump for debris, which might restrict the pump intake.
- iv. Check the diesel engine for proper fluid levels and lubricants.
- v. Lubricate the PTO and the driveshaft.
- vi. Lubricate all bearings on the pump and gear reducer. If the pump has been idle for several months, the pump oil reservoir should be drained and refilled. Do not fill pump oil reservoir to the top. Make sure to leave ½-inch to 1-inch of air space in the oil reservoir.

- vii. Check the reducer lubricant level and fill as needed.
- viii. Open the air valve on the gear reducer.
- ix. Connect the driveshaft and gear reducer.
- x. Check that all rotating machinery guards are properly attached.
- xi. Follow engine/pump start-up instructions for warm-up.

B. Normal Start-up. ***Operation during ice conditions should be avoided. The pump should be throttled down and shut off when cavitation is detected, until the cause can be determined and corrected.*** The following steps should be performed at system start-up:

- i. Thoroughly review and follow the manufacturer's operating instructions for the diesel engine.
- ii. Connect quick disconnect fuel lines to the supply and return connections of the diesel engine and on the trailer mounted fuel tank. Open valves on supply and return lines.
- iii. Start engine with clutch disengaged.
- iv. Allow engine to warm up at idle, as recommended in the engine manufacturer's instructions.
- v. Adjust engine speed to 800 revolutions per minute (rpm).
- vi. Partially engage clutch and release while observing for smooth operation, drive shaft alignment and any noisy operation. Repeat this step several times for brief periods to verify proper connection of prime driver to system.
- vii. After verification of connection, engage clutch fully at 800 rpm, then gradually increase speed on the engine to normal operating speed of approximately 1800 rpm.

C. Normal Shutdown. The following steps should be performed at shut-down:

- i. Thoroughly review and follow the manufacturer's operating instructions for the diesel engine.
- ii. Gradually reduce engine speed to approximately 800 rpm.

- iii. Allow engine to run at 800 rpm for two to three minutes to empty the pump discharge piping of water.
- iv. Disengage the clutch. (As the pump assembly comes to a stop, some water may backflow through the pump. This is normal, but the non- reverse ratchet on the gear drive should prevent reverse rotation of the pump impeller.)
- v. Allow engine to cool down by running at 800 rpm with no load for 4-5 minutes.
- vi. Shut down the engine.
- vii. Close fuel line supply and return valves before disconnecting hoses.
- viii. Close the air valve on the gear reducer.
- ix. Close the sump intake sluice gate.
- x. Disconnect drive shaft from engine PTO and from gear drive.
- xi. Check all equipment for damage or excessive wear.
- xii. Service the diesel engine off-site after each operation, in accordance with the engine manufacturer's instructions.

3. **Lower Pumping Station (Sta. 61+65).** This pumping station will be operated by USFWS. The pump station is used to unwater Lower Swan Lake.

A. **Lower Swan Lake Pump Station Inlet Gated Structure.** This item was constructed under the Swan Lake Lower Compartment Pump Station Modifications contract. The gated structure has five self-contained 108-inches wide x 84-inches high fabricated stainless steel slide gates. The slide gates are manually operated with a hand crank or with a portable drill- type electric operator. The structure also has five fish screens. The fish screens are raised and lowered with a hand operated winch. Sluice gates should be at least one (1) inch from fully closed or fully open (using hand crank) before any use of the portable electric operator. **Never use a portable electric operator to travel the final distance to close or open.** Operation and maintenance instructions for the slide gates are in the *Hydro Gate Installation, Operation & Maintenance Manual HG561 Fabricated Stainless Steel Slide Gate G2500-OG*. Operation and maintenance information for the portable electric drill-type operator are in the *Milwaukee Operator's Manual Catalog No. 2404-1*. Operation and maintenance information for the portable generator provided for use with the portable electric operator are included in the *Honda Power Equipment Owner's Manual Generator*. Operation and maintenance information for the fish screen winch is in the *Thern Owner's*

Manual for 4WM2 Series Worm Gear Hand Winch. These manufacturers' manuals are located on the CD provided with this manual.

B. Prestart Check List. The following steps shall be performed before starting the pump. See manufacturers' operation manuals for details.

- i. Check the intake water level for required submergence.
- ii. Open the intake sluice gates.
- iii. Check the intake for debris, which might restrict the pump intake. Check for silt at the intake area.
- iv. Lubricate all bearings on the pump and gear reducer. If the pump has been idle for several months, the pump oil reservoir should be drained and refilled. Do not fill pump oil reservoir to the top. Make sure to leave ½-inch to 1-inch of air space in the oil reservoir.
- v. Check the diesel engine for proper fluid levels and lubricants.
- vi. Open the air valve on the gear reducer.
- vii. Lubricate the PTO and the driveshaft.
- viii. Check the reducer lubricant level and fill as needed.
- ix. Install the drive belts and belt guard.
- x. Connect the driveshaft and gear reducer. Install drive shaft guard.
- xi. Check that all guards are in place around rotation parts.
- xii. Follow engine/pump start-up instructions for warm-up.

C. Normal Start-up. ***Operation during ice conditions should be avoided. The pump should be throttled down and shut off when cavitation is detected, until the cause can be determined and corrected.*** The following steps should be performed at system start-up:

- i. Thoroughly review and follow the manufacturer's operating instructions for the diesel engine.
- ii. Connect quick disconnect fuel lines to the supply and return connections of the diesel engine and on the trailer mounted fuel tank. Open valves on supply and return lines.

- iii. Start engine with clutch disengaged.
- iv. Allow engine to warm up at idle, as recommended in the engine manufacturer's instructions.
- v. Adjust engine speed to 800 revolutions per minute (rpm).
- vi. Partially engage clutch and release while observing for smooth operation, drive shaft alignment, belt alignment, belt tension and any noisy operation. Repeat this step several times for brief periods to verify proper connection of prime driver to system.
- vii. After verification of connection, engage clutch fully at 800 rpm, then gradually increase speed on the engine to normal operating speed of approximately 1800 rpm.
- viii. **NOTE: During initial break-in period of belt drive operation, the drive belts require frequent adjustment.**

D. Normal Shutdown. The following steps should be performed at shut-down:

- i. Thoroughly review and follow the manufacturer's operating instructions for the diesel engine.
- ii. Gradually reduce engine speed to approximately 800 rpm.
- iii. Allow engine to run at 800 rpm for two to three minutes to empty the pump discharge piping of water.
- iv. Disengage the clutch. (As the pump assembly comes to a stop, some water may backflow through the pump. This is normal. This gear drive does not have a non- reverse ratchet. It was removed in 2007 when the gear drive was repaired. It was thought that the non-reverse ratchet was contributing to an overheating problem).
- v. Allow engine to cool down by running at 800 rpm with no load for 4-5 minutes.
- vi. Shut down the engine.
- vii. Close fuel line supply and return valves before disconnecting hoses.
- viii. Close the air valve on the gear reducer.
- ix. Close the intake sluice gates.

- x. Disconnect drive shaft from engine and from jack shaft.
- xi. Remove belt guard and drive belts.
- xii. Check all equipment for damage or excessive wear.
- xiii. Service the diesel engine off-site after each operation, in accordance with the engine manufacturer's instructions.

6.04 PORTABLE PUMP

A Godwin CD250M Dri-Prime diesel driven portable, self-priming, centrifugal pump was provided for use at the Swan Lake Lower Pump Station. This pump is for use when the sump water level is too low for operation of the Cascade fixed angle-mount pump. Operation and maintenance information for the pump and engine is available in the *Godwin Pumps of America, CD250M Dri-Prime Operating & Maintenance Manual*. Permanently mounted piping is provided for connecting the suction and discharge hose. This pump is trailer mounted with the diesel engine mounted on the same trailer. The pump is driven by a John Deere 4045TF250 diesel engine. The operation manual for the diesel engine controller is *Godwin Pumps of America, Primeguard Controller Operations Manual Software Version 2:27 for John Deere Tier II Engines*.

1. Prestart. The following steps shall be performed before starting the pump. See manufacturers' operation manuals for details.
 - A. Visually inspect pump and piping. Remove any extraneous equipment, debris, or dirt.
 - B. Check engine oil, mechanical seal oil, and diesel fuel level. Replenish as necessary.
 - C. Check radiator coolant level. **Do not remove radiator cap if engine is running or warm. Serious burns or injury could result.**
 - D. Close volute and non return drain valves.
 - E. Verify proper and secure connections of pump suction and discharge lines. If used in a flooded suction application, be sure to disconnect the air ejector of the priming system to avoid damage to the compressor.
2. Normal Start-up. The following steps should be performed at system start-up:
 - A. Press safety shutdown bypass pushbutton and turn ignition switch to START. Keep bypass pressed in until sufficient oil pressure is attained (5-10 seconds).
 - B. Release bypass and allow engine to momentarily warm-up.

- C. Use throttle to increase engine rpm to desired level. Air will discharge from venturi outlet hose during priming and operation, this is normal.
 - D. Pump will prime and start to discharge effluent.
 - E. Use throttle to adjust engine speed for desired flow rate.
 - F. After starting, no other operator intervention is required other than daily maintenance requirements (see manual).
3. Normal Shutdown. The following steps should be performed at shut-down:
- A. Thoroughly review and follow the manufacturers' operating instructions.
 - B. Use throttle to gradually reduce engine speed to idle.
 - C. Allow engine to cool down by running at idle speed for 4 to 5 minutes
 - D. Turn ignition switch to STOP.
 - E. Open drain valves on Volute and Non Return section.

6.05 GRAVITY STRUCTURES

Specific operation requirements shall be performed as determined by the USFWS Site Manager. The operation and management of all stoplogs should be coordinated with the water management plan for the project.

7. PROJECT EMERGENCY OPERATIONS

Reserve supplies of materials needed to provide protection under flooding conditions, such as sandbags, sand and emergency lighting is the responsibility of the local sponsor USFWS.

8. PROJECT INSPECTION

8.01 GENERAL

The sponsor and the USACE will conduct joint inspections of project facilities at least annually for the purpose of observing and reporting current conditions of the facility and to determine the need for required repairs. The sponsor or USACE will immediately notify the other party when a problem or potential problem of project facilities is observed, and an additional joint inspection

will be held. The sponsor shall request joint inspections of project facilities after specific storm or flood events for the purpose of agreement and determination of project rehabilitation

8.02 INSPECTION PURPOSE

An active preventative maintenance program reduces damage to constructed features by taking early corrective action. Additional costs, associated with repair and rehabilitation, are also avoided. An effective preventative maintenance program requires regular, thorough inspections. These inspections will aid the USFWS Site Manager in discovering deficiencies within the project. In addition, they will provide the USFWS Site Manager with baseline condition data. This data is necessary for considering repair options of major damage.

8.03 TYPES OF INSPECTIONS

The two types of inspections for the Swan Lake project are project inspections, conducted by the USFWS Site Manager, and joint inspections, conducted by the USFWS Site Manager together with personnel from USACE.

8.04 ANNUAL PROJECT INSPECTIONS

Annual project inspections shall be performed by the USFWS Site Manager, or appropriate representative, for the purpose of noting routine deficiencies and initiating corrective actions. This inspection shall be conducted at periods not exceeding 12 months and shall follow inspection guidance presented in subsequent sections of this manual. It is suggested that the inspection be conducted every spring or fall, whichever is representative of site conditions following high river levels. Additional project inspections shall occur as necessary after flood events or as scheduled by the USFWS Site Manager. A project inspection checklist has been developed as presented in Appendix D. It is required that the USFWS Site Manager furnish a signed copy of the completed checklist to the U.S. Army Corps of Engineers; St. Louis District; ATTN: CEMVS-ED; 1222 Spruce Street; St. Louis, Missouri, 63103, immediately following each project inspection.

8.05 JOINT INSPECTIONS

Joint inspections by the USFWS Site Manager, and USACE shall be completed in accordance with the Memorandum of Agreement. These inspections shall be initiated by USACE. The purpose of joint inspections is to assure that adequate maintenance is being performed as presented in this manual. The St. Louis District Engineer or Authorized Representative shall have access to all portions of the constructed project upon coordination with the USFWS Site Manager.

Additional joint inspections shall be formally requested by the USFWS Site Manager immediately following a specific storm or flood event that causes damage in excess of the annual operation and maintenance costs specified in this manual. A comparison of project inspections before and after such events together with the joint inspections shall be the basis for determining maintenance responsibility and potential rehabilitation by USACE as stated in the Memorandum of Agreement.

9. PROJECT MAINTENANCE

The sponsor is responsible for the administration, operation, maintenance, and repair of the project in accordance with the existing MOA, the DPR, and this supplement. The sponsor shall maintain books, records, and accounting of all funds expended on the project within a mutually accepted accounting procedure. The sponsor shall incorporate all necessary information concerning the operation, maintenance and repair of the Project into its Annual Management Plan. The sponsor shall be required to fulfill maintenance tasks as described for each feature of the project in this manual.

9.01 PROJECT LEVEES

Maintenance requirements for the Riverside (Exterior) Levees and the Interior Levees are as follows:

1. General Requirements. USFWS shall provide at all times such maintenance as may be required to insure serviceability of the structures. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting of willows or other suitable growth on areas riverward of the levees. Periodic inspections shall be made by USFWS to insure that the above maintenance measures are being effectively carried out and further, to be certain:
 - A. No unusual settlement, sloughing, erosion, or material loss of grade or levee cross section has taken place.
 - B. There are no signs of caving on either the land side or the river side of the levee, which might affect the stability of the levee section.
 - C. No seepage, saturated areas, or sand boils are occurring.
 - D. No revetment work or riprap has been displaced, washed out, or removed.
 - E. No action is being taken which can retard or destroy the growth of sod, such as burning grass and weeds during inappropriate seasons.

- F. Access roads to and on the levee are being properly maintained.
 - G. Cattle guards and gates are in good condition.
 - H. Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained.
 - I. There is no unauthorized grazing or vehicular traffic on the levees.
 - J. Encroachments are not being made on the levee right-of-way, which might endanger the structure or hinder its proper and efficient functioning of the embankment
2. Detailed Requirements. In addition to the general requirements described above additional detailed maintenance requirements for levee works are as follows:
- A. General. It is the responsibility of the sponsor to maintain the integrity of stone protection works and also the vegetated areas that provide stability to levee slopes. Inspections to detect erosion, scour, tension cracks and sinkholes at or adjacent to the protected areas shall be conducted on a regular basis. Visual observances of flaws or defects shall be clearly documented and photographed. Erosion and scour can cause losses of earthen material and may potentially jeopardize the stone protection. If there is severe weathering of some materials in the stone protected areas, additional stone shall be placed to cover these materials and to prevent additional losses of stone protection. Pockets of rearranged or missing stone should be filled with materials similar in size and quality to that provided under the contract documents. It is extremely important to observe the termination points of the stone placement. Inspections of the stone protection work shall be made at least once every 90 days, preferably during the dry periods when the water level is low.
 - B. Mowing. Levee slopes not subject to erosion from wavewash or ice shall be mowed periodically to discourage the growth of weeds and saplings. A good mowing program will enhance a dense sod that will resist wave wash and erosion during periods of high water. Grass should be kept at a height less than 14 inches. The grass should be cut back to a height of approximately 4 to 6 inches during the growing season; it may be necessary to mow at least two or three times each year to maintain a stand of grass within these prescribed limits. The height of the grass should be at least 8 inches when it becomes dormant prior to winter.
 - C. Herbicides. Mowing should be supplemented by the periodic use of environmentally acceptable herbicides to discourage the growth of weeds and brush. All riprap areas along the levee slope shall be sprayed once in the spring and once in the fall with "Rodeo" (by Roundup) or equal to eradicate weeds and woody growth.

- D. Treatment of Sprouts. The stumps of trees cleared from the levees should be treated by spraying with herbicides to eliminate the growth of sprouts.
- E. Rodent and Burrowing Animals. Rodent dens can undermine and potentially damage the levees. Rodents and burrowing animals should be destroyed during inspections and their dens excavated and backfilled with compacted fill. Routine mowing of the levee slopes and chemical control of weeds and woody growth should discourage rodents and burrowing animals from establishing dens in the earth levees. Various other methods are available for removal of rodents and burrowing animals. However, the best methods of removing rodents and burrowing animals from the levee system will be developed by experimentation. Care should be used to determine local game laws and their applicability to the method chosen for extermination. Following are several methods of extermination that have proven satisfactory. Suggested methods include:
- i. Fish and wildlife cartridge.
 - ii. Cyanide gas.
 - iii. Exhaust fumes (carbon monoxide).
 - iv. Butane or propane gas.
 - v. Anhydrous ammonia.
- F. Woody Growth. Levee slopes not subject to erosion from wavewash or ice shall have trees, brush, and other woody growth removed on the levee slope and within 15' of the levee toe in order to maintain the long-term integrity of the levee structure. The periodic removal of this growth is far more economical than extensive tree removal that may be necessary if these saplings are not removed at an early stage.
- G. Earth-lined Channel Inspection. During periodic inspection of the channels, careful attention should be given to the following items:
- i. No unusual settlement, sloughing, or material loss of grade or cross section has taken place.
 - ii. No caving has occurred within or adjacent to the channel, which might affect the stability of the section.
 - iii. No revetment work or riprap has been displaced, washed out, or removed.
 - iv. No action is being taken, such as burning grass and weeds, which will retard the growth of sod.

- v. No wave wash or scouring has occurred.
 - vi. Drift shall be removed from levee slopes at the end of each winter flood season, before the new growth of grass starts in the spring, and after each high water event occurring during the growing season. Drift should not be burned on the levee slope or right-of way.
 - vii. Gullies, holes and washes in the channel should be filled with materials matching that required by the original contract documents, including all amendments and modifications thereto.
- H. Seeding. Reseeding of damaged areas, mulching, fertilizing, and preparation, shall be accomplished with seed mixtures, mulch, fertilizer, and rates and methods of application matching that required in the original contract documents for the particular area requiring repair. Seeding periods are as follows:
- i. Fall Seeding: 15 August to 20 September
 - ii. Spring Seeding: 15 February to 15 April
 - iii. Repair and Preparation of Seedbed. Repairs required to correct conditions disclosed by the inspection should be made promptly, especially during non-flood season, in anticipation that high water may retard or prevent later accomplishment. In the event of severe damage a report should be made to the District Engineer, U. S. Army Engineer District, 1222 Spruce Street, St. Louis, Missouri 63103, including a description of the damage and proposed repair action. The channel slopes should be dressed so that they may be traveled with mowing equipment. Prior to mulching, the area to be seeded should be disked or harrowed to loosen the soil.
 - iv. Touchup or over seeding. Where the stand of grass is thin, the growth shall be thickened by over seeding with grass seed. This should be done in late winter or early spring between 15 February and 15 April, preferably in the early part of the period.
 - v. Fertilizing. If the soil is suspected of containing insufficient nutrients to provide proper growth, a laboratory analysis shall be performed. Fertilization shall be performed only as a result of such an analysis. At the time of seeding, apply 33% ammonium nitrate fertilizer, or an equivalent thereof, in such quantity to yield 50 pounds of nitrogen per acre. In the case of 33% ammonium nitrate, 150 pounds of fertilizer per acre will be required. Fertilizer should be applied by drill, or broadcast uniformly on the area. The

fertilizer should be disked or harrowed into the soil.

- vi. Supplemental Fertilizing. A thick, healthy stand of grass furnishes protection to earthen embankments against surface erosion, and so minimizes the amount of possible repair needed. It is recommended that a feeder application of fertilizer consisting of 12/12/12 mixture be applied about every third year at a rate of 100 to 200 pounds per acre. Soil sampling is recommended which will indicate the proper mixture required and may reduce the rate and cost of application.

9.02 PUMPING STATIONS

Maintenance requirements for the permanently mounted pumps, associated equipment and trailer mounted diesel power units are described in the manufacturers' operating manuals. Annual periodic inspections will be performed to assess the operating condition of the pumps, gear reducers, engine and appurtenances. Annual inspections should be scheduled for an occasion where the pumps may be operated with sufficient water available for proper demonstration of pumping.

1. Concrete Structure. All visible concrete surfaces should be inspected for cracks, spalling, corrosion, or exposed reinforcement. All structural steel items should be inspected for warpage, damage, corrosion or lost fasteners. Repairs shall be made within 30 days of discovery, including grouting, coating repair, epoxy repairs and fastener replacement.
2. Pump Assembly
 - A. Upper Pump Station: The pump assembly consists of the vertical lineshaft pump, gear reducer, drive belts and sheaves, driveshaft assembly, jack shaft assembly, portable diesel engine assembly, discharge pipe, discharge flap gate, and appurtenances. The pump assembly should be inspected during operation for any improper vibration, noise, excessive heat, sump vortices, or cavitation. Operation during ice conditions should be avoided. The pump should be throttled down and shut off when cavitation is detected, until the cause can be determined and corrected. Any serious damage should be reported immediately to USACE and USFWS for determination of corrective action. Simple repairs, such as painting and repair of fasteners, should be performed by USFWS prior to any pump operation.

- B. Middle Pump Station: The pump assembly consists of the pump, gear reducer, driveshaft assembly, portable diesel engine assembly, discharge pipe, discharge flap gate, and appurtenances. The pump assembly should be inspected during operation for any improper vibration, noise, excessive heat, sump vortices, or cavitation. Operation during ice conditions should be avoided. The pump should be throttled down and shut off when cavitation is detected, until the cause can be determined and corrected. Any serious damage should be reported immediately to USACE and USFWS for determination of corrective action. Simple repairs, such as painting and repair of fasteners, should be performed by USFWS prior to any pump operation.
- C. Lower Pumping Station: The pump assembly consists of the angle-mounted lineshaft pump, gear reducer, drive belts and sheaves, driveshaft assembly, jack shaft assembly, portable diesel engine assembly, Dresser coupling, discharge pipe, discharge flap gate, support piles and appurtenances. The pump assembly should be inspected during operation for any improper vibration, noise, excessive heat, sump vortices, or cavitation. Operation during ice conditions should be avoided. The pump should be throttled down and shut off when cavitation is detected, until the cause can be determined and corrected. Any serious damage should be reported immediately to USACE and USFWS for determination of corrective action. Simple repairs, such as painting and repair of fasteners, should be performed by USFWS prior to any pump operation.
- i. Sump. The sump should be checked periodically for excessive siltation. Silt should be cleaned periodically from the sump to prevent pump cavitation. All large debris should be removed from the sump area for proper disposal.
 - ii. Pile Supports. The “H”-pile and pipe pile supports should be inspected annually, and prior to any operation, for cracks, dents, bending, settlement, twisting and corrosion.
 - iii. Dresser Coupling. The Dresser coupling should be inspected annually, and prior to any operation, for damage to any flanges, middle ring, gaskets, fasteners or pipe. Loose fasteners should be tightened prior to operation. Corroded fasteners should be replaced prior to operation. After commencement of operation the coupling should be inspected for excessive vibration or leakage.
 - iv. Discharge Flap Gate. The flap gate located on the end of the discharge pipe should be cleaned and inspected every six months for damage and to ensure there is nothing caught inside that would prevent closure every six months. Clean and grease seating faces when general cleaning is performed with Fiske Brothers Lubriplate No. 630 AAA or equivalent. Keep flap valves painted to prevent corrosion. Flap valves supplied with grease fittings at the pivot

points should be lubricated every six months with Fiske Brothers Lubriplate No. 630 AAA or equivalent.

- v. Right Angle Reducer. The gear reducer should be inspected for proper lubricant level prior to each operation. Sufficient lubricant to meet the manufacturer's recommendations should be added prior to each operation. After the engine has reached normal speed, and for at least fifteen (15) minutes of subsequent pump operation, the reducer should be checked for excessive noise, vibration or temperature. The gear reducer should be thoroughly inspected after each flood event during which the gear reducer is submerged.
 - vi. Drive Belts and Sheaves. The drive belts and sheaves should be inspected annually, and prior to any operation, for cracks, wear, bending, twisting, sagging, slack and corrosion. Cracked or worn belts should be replaced prior to any operation. Corroded sheaves should be cleaned and painted. Any slack, sag or twisting of the belts from their normal orientation should be corrected prior to operation. The jack shaft assembly pillow block bearings should be lubricated prior to any operation.
 - vii. Driveshaft Assembly. The driveshaft assembly should be inspected annually, and prior to any operation, for cracks, bending, twisting, sagging, lubricant and corrosion. The universal joints should be lubricated prior to any operation
- D. Diesel Power Units. The diesel power units should be inspected annually and prior to any operation, for proper fluid levels, lubrication, coolant, air filter, fuel filter, battery and muffler. The engine trailer should be inspected for tire inflation and wear, axle lubrication, operating brakes and signal lights, hitch and safety chains, and damage to paint coating. All fluids and filters should be at their proper operating levels and conditions prior to transport to the pumping station. The engine should be operated prior to transport to the pumping station to establish operational worthiness, including function of the clutch and instrumentation. After connection to the driveshaft, the engine should be operated as indicated above. The operator should record oil pressure, coolant temperature, charging amperage, revolutions per minute (rpm), and hours of operation. This data will be used to assess the condition of the engines over time.

- E. Upper and Middle Pump Station Sluice Gates. Operation and maintenance of the sluice gates is described in the *Installation, Operation, Maintenance, and Training Manual for Hydro Sluice Gates Heavy Duty Series, Hydro Gate Corporation.*
- i. General. Periodic cleaning is required to maintain smooth operation. The gate, stem, and frame support should be inspected for corrosion, wear, and damage. Periodic painting should be performed to minimize corrosion. All adjustments to the wedges, as required by wear, should be in accord with operation and maintenance manual. The gates should be cycled regularly to alleviate “sticking”. Cycling every three (3) months recommended (unless gates need to remain closed for water management purposes).
 - ii. Operating Stem. The operating stem should be cleaned and greased with the lubricant mixture recommended in the operation and maintenance manual at least every six (6) months.
 - iii. Gate Operator. The gate operator should be lubricated prior to each new period of operation, but not less than 4 times annually. The hand crank should be turning when grease is pumped into the fittings. Each fitting should receive the amount of grease delivered by 4-5 pumps of the grease gun handle.
 - iv. Grating. All walkway grating should be inspected for corrosion and loose sections, Grating supports should be free of corrosion and cracking. All bolts and clips should be snug and corrosion free.
- F. Lower Pump Station Slide Gate Structure. The slide gate structure located at Lower Pump Station should be inspected prior to each new period of operation. All structural steel items should be inspected for warpage, damage, corrosion, lost fasteners or cracked welds. Column anchorages should be intact and free of cracking and corrosion. Repairs should be made within 30 days of discovery, including any grouting, coating repair and fastener replacement.
- G. Lower Pump Station Slide Gates. Operation and maintenance of the slide gates is described in the *Installation, Operation, Maintenance, and Training Manual HG561 Fabricated Stainless Steel Slide Gate G2500-OG, Hydro Gate Corporation.*

- i. General. Cleaning and inspection should be performed every six (6) months. Periodic cleaning is required to maintain smooth operation. The gate, stem, and frame support should be inspected for wear, and damage. Periodic painting of the hoist pedestal and gear boxes should be performed to minimize corrosion.
- ii. Operating Stem. The operating stem threads and lift nut threads should be inspected for wear, cleaned and lubricated every six (6) months. See wear checking procedure and cleaning and lubrication instructions in manufacturer's maintenance manual.
- iii. Gate Operator. The gate operator should be lubricated prior to each new period of operation, but not less than every six (6) months. The hand crank should be turning when grease is pumped into the fittings. See lubricant recommendation and lubrication instructions in manufacturer's manual.

G. Lower Pump Station Fish Screen Winch. The winch should be cleaned and inspected before every operation or at least every six (6) months. The wire rope, end connections and fittings should be inspected before each operation for corrosion, kinking, bending, crushing, bird caging, broken wires, reduction in rope diameter or other signs of damage. The winch should be lubricated in accordance with the manufacturer's instructions. See manufacturer's manual for cleaning, inspection and lubrication instructions.

9.03 PUMPING STATION RETAINING WALLS

Maintenance requirements for the retaining walls should be as follows:

1. Sheet Pile. The aboveground sheet pile should be inspected annually during low water stages for corrosion, perforation, bulging and any other damage. In addition, material loss or settlement behind or in front of the sheet pile wall should be noted. Any serious damage should be reported immediately to USACE and USFWS for determination of corrective action.
2. Tie-Rods. The tie-rod connections at the wales should be inspected annually for loose fasteners, corrosion, weld cracks and any other damage. Any serious damage should be reported immediately to USACE and USFWS for determination of corrective action. Simple repairs, such as painting and repair of fasteners, should be performed by USFWS prior to any pump operation.
3. Discharge Pipe Penetrations. The discharge pipe penetrations should be inspected for loss of material or geotextile at the 3-inch annular space between pipe and sheet pile. Collar type penetrations should be inspected to ensure integrity of welds, annular space sealant, collar plates and other appurtenances. The discharge pipe, including flap gates, should be inspected for corrosion or any other damage. Any serious

damage should be reported immediately to USACE and USFWS for determination of corrective action. Simple repairs, such as painting and repair of fasteners, should be performed by USFWS prior to any pump operation.

9.04 WATER CONTROL STRUCTURES

Maintenance requirements for the drainage structures are described herein, and as noted in the *Waterman Industries, Inc. Operation and Maintenance Manual for Sluice and Canal Gates*. Annual periodic inspections will be performed to assess the operating condition of the gates, operators, access ladders, corrugated metal pipe (CMP) and appurtenances. Annual inspections should be scheduled for low water occasions where the maximum extent of the equipment will be accessible. Any serious damage should be reported immediately to USACE and USFWS for determination of corrective action. Simple repairs, such as painting and repair of fasteners, should be performed by USFWS prior to any operation.

1. Sluice Gate. Periodic cleaning is required to maintain smooth operation. The gate, stem, and frame support should be inspected for corrosion, wear, and damage. Periodic painting should be performed to minimize corrosion. All adjustments to the wedges, as required by wear, should be in accord with operation and maintenance manual. The gates should be cycled regularly to alleviate “sticking”. Cycling at minimum three (3) month intervals is recommended.
2. Operating Stem. The operating stem should be cleaned and greased with the lubricant mixture recommended in the operation and maintenance manual at least every six (6) months.
3. C. Gate Operator. The gate operator should be lubricated prior to each new period of operation, but not less than 4 times annually. The hand crank should be turning when grease is pumped into the fittings.
4. Each fitting should receive the amount of grease delivered by 4-5 pumps of the grease gun handle.
5. Grating. All walkway grating should be inspected for corrosion and loose sections. Grating supports should be free of corrosion and cracking. All bolts and clips should be snug and corrosion free.

9.05 GRAVITY STRUCTURES

Maintenance requirements for the stop log structures are described herein, and in the operation and maintenance manual for the jib crane. Annual periodic inspections will be performed to assess the operating condition of the stop logs, concrete structure, jib crane, and appurtenances. Annual inspections should be scheduled for low water occasions where the maximum extent of the equipment will be accessible. Any serious damage should be reported immediately to USACE and USFWS for determination of corrective action. Simple repairs, such as painting and repair of fasteners, should be performed by USFWS prior to any operation.

1. Stop Log. All stop logs should be inspected for warpage, cracks, deformities, deterioration or other damage, which would prevent proper installation or sealing prior to each use. Connection points should be inspected for corrosion, weld cracking or loose bolts. Damaged stop logs should be replaced before installation.
2. Concrete Structure. All visible concrete surfaces should be inspected for cracks, spalling, corrosion, or exposed reinforcement prior to each use.
3. Concrete Bridge. Concrete bridge superstructure and substructure should be inspected for cracking, spalling, exposed reinforcement, settlement, and other signs of deterioration. Associated safety rail and guard rail should be inspected for corrosion, impact, and other signs of deterioration. Railing anchorages should be intact without signs of settlement or cracking. Inspections as defined by the most current version of the USFWS 362 FW 3 Vehicular Bridge Inspection regulations should be performed along with those required by other regulating authorities. Inspections will include an initial Inventory Level Inspection based on the bridge's class designation per applicable inspection regulation guidelines. Further inspections will follow the guidelines of a Routine Inspection performed at intervals defined by the bridges class designation and, if needed, a Special Inspection, performed only if damage is inflicted by environmental or manmade disasters or if previous inspections cite the need for additional inspection.
4. Jib Crane. The jib crane should be inspected prior to each new period of operation. All structural steel items should be inspected for warpage, damage, corrosion or lost fasteners. Column anchorages should be intact and free of cracking and corrosion. Repairs should be made within 30 days of discovery, including any grouting, coating repair and fastener replacement.
5. Hydraulic Power Unit. The hydraulic power unit should be prepared for use as recommended by the manufacturer prior to each use in the field. Check all fluid levels and fill to appropriate level. Check all hoses, motor, pump, directional control valve, etc. for leaks. Tighten leaking connections, or replace parts as required.
6. Sheet Pile. The aboveground sheet pile should be inspected annually during low water stages for corrosion, perforation, bulging and any other damage. In addition, material loss or settlement behind or in front of the sheet pile wall should be noted. Any serious damage should be reported immediately to USACE and USFWS for determination of corrective action.
7. Tie-Rods. The tie-rod connections at the wales should be inspected annually for loose fasteners, corrosion, weld cracks and any other damage. Any serious damage should be reported immediately to USACE and USFWS for determination of corrective action. Simple repairs, such as painting and repair of fasteners, should be performed by USFWS prior to any pump operation.

8. Grating. All walkway grating should be inspected for corrosion and loose sections, grating supports should be free of corrosion and cracking. All bolts and clips should be snug and corrosion free.

9.06 PORTABLE PUMP

See manufacturer's manual located in Appendix E for daily preventive maintenance, 100 hour break-in maintenance, 250 hour preventative maintenance, troubleshooting guide, servicing information, drawings and checklists. Operation and maintenance information for the pump and engine is available in the *Godwin Pumps of America, CD250M Dri-Prime Operating & Maintenance Manual*. The operation manual for the diesel engine controller is *Godwin Pumps of America, Primeguard Controller Operations Manual Software Version 2:27 for John Deere Tier II Engines*.

10. PROJECT REPAIR, REPLACEMENT, AND REHABILITATION

10.01 GENERAL

The sponsor is responsible for the repair, replacement, and rehabilitation of the project in accordance with the existing MOA, the DPR, and this supplement. The sponsor shall maintain books, records, and accounting of all funds expended on the project within a mutually accepted accounting procedure. The sponsor shall incorporate all necessary information concerning the operation, maintenance and repair of the Project into its Annual Management Plan. The sponsor shall be required to fulfill repair, replacement, and rehabilitation tasks as described for each feature of the project in this manual. Repair is considered to entail those activities of a routine nature that maintain the project in a well-kept condition. Replacement covers those measures taken when a worn-out element, or portion thereof, is replaced. Rehabilitation refers to a set of activities necessary to bring a deteriorated project back to its original condition. Project repair, replacement and rehabilitation actions are to conform to the project as-built plans and specifications, unless other arrangements are made with the USACE, St. Louis District Commander. These activities are the responsibility of the project sponsor.

10.02 REHABILITATION REQUIREMENTS

The USACE is responsible for the federal share and the performance of any mutually agreed upon rehabilitation of the project in accordance with the existing Memorandum of Agreement, the DPR and this supplement. The federal share of rehabilitation is defined to be reconstructive work needed in excess of estimated annual operation, maintenance and repair costs as a result of specific storm or flood events, exceeding the design event.

10.03 IMPROVEMENTS, REPAIRS OR ALTERATIONS

The USACE, St. Louis District Commander shall be informed of all future improvements, repairs or alterations to this environmental enhancement project. Any portions of the existing levee works damaged by flood waters shall be repaired to the original condition in accordance with the requirements of the contract documents, including all amendments and modifications thereto.

10.04 PROJECT FEATURE REPLACEMENT

If a project feature, such as an area of levee, riprap revetment, pumping station, or structure, is damaged to the point where it needs to be completely replaced, the sponsor shall coordinate with the USACE, St. Louis District Commander about the planned replacement. In general, the replacement feature should conform to the original design of that feature.

10.05 PROJECT FEATURE ALTERATION.

Whenever it is necessary to alter project features that have been constructed with Federal funds, or rehabilitated with Federal funds, for which operation and maintenance assurances have been executed by USFWS, it is necessary to secure prior approval from the USACE, St. Louis District Commander. When a third party, such as a utility or pipeline company, desires to alter the levee work, they must secure approval from USFWS, who, in turn, will secure approval from the USACE, St. Louis District Commander. All matters pertaining to “Alterations” should be addressed to the USACE, St. Louis District Commander.

11. NOTIFICATION OF PROJECT DISTRESS

11.01 GENERAL

Evidence of distress at the Swan Lake Project shall be immediately reported to the USACE, St. Louis District Commander. Notification shall be in writing. Special inspections, to evaluate damages or changed conditions, should be made immediately following the report of project distress. This is particularly important in the case of earthquake damage.

11.02 REPORTABLE DISTRESS SIGNALS

Typical signals of project distress to be reported are as follows:

1. Sloughing, settlement, or slides in embankments, such as levees, dams, bridge abutments or slopes of channels.
2. Evidence of piping or muddy water boils in the vicinity of a structure such as embankments, abutments, and retaining walls.
3. Abnormal increase or decrease of flow from foundation drains, structural joints, or face drains of concrete dams.
4. Any increase in seepage quantities through or under embankments or abutments.
5. Unusual vertical or horizontal movement or cracking of embankments, abutments or structures.
6. Significant cracking of mass concrete structures.
7. Sinkholes or localized subsidence in the foundation of, or adjacent to, embankments or other pertinent structures critical to the safe operation of the project.
8. Excessive deflection, displacement, or vibration of concrete structures (e.g., tilting or sliding of structure).
9. Erratic movement, binding, excessive deflection, or vibration of outlet gates, stop logs, or pump mounting piles.
10. Significant damage to any structure.
11. Significant damage to any feature resultant from a seismic event.
12. Any other indications of distress or potential failure that could inhibit the operation of the project or endanger life and property.
13. Excessive vibration, binding, unusual noises, movements, or deflections of gate hoist operating equipment.
14. Actual hydraulic equipment operating pressure in excess of 125 percent of the normal operating pressure.
15. Erratic movement or unusual sounds such as bumping, jumping, or popping of mechanical equipment and appurtenances.

16. Wire rope lifting cables, chains, etc. having broken, deformed worn or corroded elements.
17. Frequent power interruptions.
18. Failure of major mechanical or electrical equipment.

May 94

APPENDIX A- MEMORANDUM OF AGREEMENT (MOA)

MEMORANDUM OF AGREEMENT
BETWEEN
THE UNITED STATES FISH AND WILDLIFE SERVICE
AND
THE DEPARTMENT OF THE ARMY
FOR
ENHANCING FISH AND WILDLIFE RESOURCES
OF THE
UPPER MISSISSIPPI RIVER SYSTEM
AT
SWAN LAKE, ILLINOIS

I. PURPOSE

The purpose of this memorandum of agreement (MOA) is to establish the relationships, arrangements, and general procedures under which the U.S. Fish and Wildlife Service (USFWS) and the Department of the Army (DOA) will operate in constructing, operating, maintaining, repairing, and rehabilitating Swan Lake, a separable element of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

II. BACKGROUND

Section 1103 of the Water Resources Development Act of 1986, Public Law 99-662, authorizes construction of measures for the purpose of enhancing fish and wildlife resources in the Upper Mississippi River System. The project area is managed by the USFWS and is on land managed as a national wildlife refuge. Under Conditions of Section 906(e) of the Water Resources Development Act of 1986, Public Law 99-662, 100 percent of the construction costs of fish and wildlife features for Swan Lake are the responsibility of DOA and pursuant to Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580, 100 percent of the costs of operation and maintenance for Swan Lake are the responsibility of USFWS.

III. GENERAL SCOPE

The Project accomplished pursuant to this MOA shall consist of enhancing fish and wildlife habitat by reducing sediment, by providing a means of water level control, by reducing the effects of wind generated waves, and by implementing a variety of habitat management practices.

IV. RESPONSIBILITIES

A. DOA is responsible for:

(1) Construction. Construction of the project which consists of constructing dike/levee closures, island structures, gated water control structures, pumps, boat ramps and access roads.

(2) Major Rehabilitation. The Federal share of any mutually agreed upon rehabilitation of the project that exceeds the annual operation and maintenance requirements identified in the definite project report and that is needed as a result of specific storm or flood events.

(3) Construction Management. Subject to and using funds appropriated by the Congress of the United States, and in accordance with Section 906(e) of the Water Resources Development Act of 1986, Public Law 99-662, DOA will construct Swan Lake as described in the definite project report, Swan Lake Rehabilitation and Enhancement Main Report, Pool 26, Illinois River, Calhoun County, Illinois, December 1991 (revised January 1993), applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws, regulations, and policies.

The USFWS will be afforded the opportunity to review and comment on all modifications and change orders prior to the issuance to the contractor of a Notice to Proceed. If DOA encounters potential delays related to construction of the project, DOA will promptly notify USFWS of such delays.

(4) Maintenance of Records. The DOA will keep books, records, documents, and other evidence pertaining to costs and expenses incurred in connection with construction of the project to the extent and in such detail as will properly reflect total costs. The DOA shall maintain such books, records, documents, and other evidence for a minimum of three years after completion of construction of the project and resolution of all relevant claims arising therefrom, and shall make available at its offices, at reasonable times, such books, records, documents, and other evidence for inspection and audit by authorized representatives of the USFWS.

(a) FWS is responsible for operation, maintenance, and repair. Upon completion of construction, as determined by the District Engineer, St. Louis District, the USFWS shall accept the Project and shall operate, maintain, and repair the Project as defined in the Definite Project Report entitled, Swan Lake Rehabilitation and Enhancement Main Report, Pool 26, Illinois River, Calhoun County, Illinois, December 1991 (revised January 1993), in accordance with Section 107(b) of the Water Resources Development Act of 1992, Public Law (102-580).

V. MODIFICATION AND TERMINATION

This MOA may be modified or terminated at any time by mutual agreement of the parties. Any such modification or termination must be in writing unless otherwise modified or terminated, this MOA shall remain in effect for a period of no more than 50 years after initiation of construction of the project.

VI. REPRESENTATIVES

The following individuals or their designated representatives shall have authority to act under this MOA for their respective parties.

FWS: Regional Director
U.S. Fish and Wildlife Service
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111-4056

DOA: District Engineer
U.S. Army Corps of Engineers, St. Louis District
1222 Spruce Street
St. Louis, Missouri 63103-2833

VII. EFFECTIVE DATE OF MOA

This MOA shall become effective when signed by the appropriate representatives of both parties.

THE DEPARTMENT OF THE ARMY

THE U.S. FISH AND WILDLIFE SERVICE

BY: Thomas C. Suermann
(signature)
THOMAS C. SUERMANN
Colonel, Corps of Engineers
St. Louis District
Service

BY: Sam Marler
(signature)
SAM MARLER
Regional Director
U.S. Fish and Wildlife

CELMS-PM-M

25 April 1994

MEMORANDUM FOR CELMS-RM-F

SUBJECT: Modification No. 5 to Interagency Agreement NO. 14-48-0010-92-900 between U.S. Fish and Wildlife Service (USFWS) and U.S. Army Corps of Engineers, St. Louis District

1. Interagency Agreement No. 14-48-0010-92-900 states that the USFWS will reimburse the St. Louis District for construction management services to USFWS at the Crab Orchard National Wildlife Refuge. Modification No. 5 extends the coverage of the agreement from March 1, 1994 to June 15, 1994.
2. The original of Modification No. 5 is enclosed.
3. If you have any questions, please contact me at 8045.

Sharon Cotner
 SHARON COTNER
 Project Management Branch
 Programs & Project Management
 Division

CF:
 CELMS-RM-M ✓
 CELMS-RO-S (Viehweg)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE PAGE OF PAGE:
1 1

2. AMENDMENT/MODIFICATION NO. Modification No. 5	3. EFFECTIVE DATE 04/01/94	4. REQUISITION/PURCHASE REQ. NO. N/A	5. PROJECT NO. (If applicable) Crab Orchard IA
6. ISSUED BY U.S. Fish and Wildlife Service Branch of Construction Contracting P.O. Box 25207, DFC Denver, CO 80225-0207		7. ADMINISTERED BY (If other than Item 6)	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) U. S. Army Corps of Engineers Assistant Chief, Construction Division St. Louis District - 1222 Spruce Street St. Louis, MO 63101-2823	(W)	9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
	X	10A. MODIFICATION OF CONTRACT/ORDER NO. IA #14-48-0010-92-900
		10B. DATED (SEE ITEM 13) 10/17/91

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers is extended, is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:
 (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)
DCN: 98695-2-5001

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(W)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: Section IX, Special Provisions, Subparagraph D, Modifications
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor is not, is required to sign this document and return 2 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

A. The purpose of this modification is to extend the term of the agreement for construction management services at U. S. Fish and Wildlife Service facilities in Crab Orchard National Wildlife Refuge.

B. Delete paragraph VI, PERIOD OF PERFORMANCE and substitute the following:
 The period of performance of this Agreement shall be from December 1, 1991 to June 15, 1994.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) THOMAS C. SUERMANN, COL, EN Commanding	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Albert S. Lubran, FWS 9-9-015 Contracting Officer
15B. CONTRACTOR/OFFEROR for <u>Randal B. Sanchez, MAJ, EN</u> (Signature of person authorized to sign)	16B. UNITED STATES OF AMERICA BY <u>Albert S. Lubran</u> (Signature of Contracting Officer)
15C. DATE SIGNED 21 Apr 94	16C. DATE SIGNED 04/01/94

CELMS-PM-M

7 June 1994

MEMORANDUM FOR CELMS-RM-M

SUBJECT: Modification No. 6 to Interagency Agreement No. 14-48-0010-92-900 between USFWS and U.S. Army Corps of Engineers, St. Louis District

- 1. Interagency Agreement No. 14-48-0010-92-900 states that the USFWS will reimburse the St. Louis District for construction management services to USFWS at the Crab Orchard National Wildlife Refuge, Little Grassy Dam. Modification No. 6 extends the coverage of the agreement to 1 August 1994.
- 2. A copy of modification no. 6 is enclosed.
- 3. If you have any questions, please contact me at 8045.



SHARON COTNER
Project Management Branch
Programs & Project Management
Division

CF:
CELMS-RO-S

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT			1. CONTRACT ID CODE N/A	PAGE OF PAGES 1 1
2. AMENDMENT/MODIFICATION NO. Modification No. 0006	3. EFFECTIVE DATE 05/26/94	4. REQUISITION/PURCHASE REQ. NO. N/A	5. PROJECT NO. (If applicable) Crab Orchard IA	
6. ISSUED BY U.S. Fish and Wildlife Service Branch of Construction Contracting P.O. Box 25207, DFC Denver, CO 80225-0207		7. ADMINISTERED BY (If other than Item 6)	CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) U.S. Army Corps of Engineers Assistant Chief, Construction Division St. Louis District - 1222 Spruce Street St. Louis, MO 63101-2823			(W)	9A. AMENDMENT OF SOLICITATION NO.
				9B. DATED (SEE ITEM 11)
			X	10A. MODIFICATION OF CONTRACT/ORDER NO. IA #14-48-0010-92-900
				10B. DATED (SEE ITEM 13) 10/17/94
CODE	FACILITY CODE			

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers is extended, is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

DCN: 98695-2-5001

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(W)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
XX	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor is not, is required to sign this document and return 2 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

A. The purpose of this modification is to extend the term of the agreement for construction management services at the U.S. Fish and Wildlife Service facilities in Crab Orchard National Wildlife Refuge.

B. Delete paragraph VI, Period of Performance and substitute the following:

The period of performance of this agreement shall be from December 1, 1991 to August 1, 1994.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) THOMAS C. SUERMANN, COL, EN Commanding		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Albert S. Lubran Contracting Officer, FWS 9-9-015	
15B. CONTRACTOR/OFFICER <i>Thomas C. Suermann</i> (Signature of person authorized to sign)	15C. DATE SIGNED 7 June 1994	16B. UNITED STATES OF AMERICA BY _____ (Signature of Contracting Officer)	16C. DATE SIGNED 05/26/94

APPENDIX B – INDEX OF GENERAL PROJECT DRAWINGS

Note: The following drawings are of principle interest for OMRR&R purposes. Complete "As-Advertised" drawings and complete "As-Built" drawing files are located on the CD furnished as part of this manual. Hard copies of the drawings are not provided but may be printed from the CD.

SWAN LAKE HABITAT REHABILITATION ITEM 1	
SHEET	TITLE
M-EMP 0/3	PROJECT LOCATION, DRAWING INDEX, SITE AND VICINITY MAP
M-EMP 1/3	GENERAL SITE PLAN
M-EMP 7/20.1	LEVEE PLAN
M-EMP 7/21	LEVEE PLAN
M-EMP 7/22	FINAL GRADING PLANS
M-EMP 7/23	LEVEE PROFILE STA 346+12.52 TO STA 485+20
M-EMP 7/24	TYPICAL SECTIONS AND DETAILS
M-EMP 98/2	SOIL LEGEND
M-EMP 98/1	BORING LOGS
M-EMP 99/1	HARDIN, ILLINOIS STAGE HYDROGRAPH
M-EMP 99/2	HARDIN, ILLINOIS STAGE HYDROGRAPH

SWAN LAKE HABITAT REHABILITATION AND PUMPING ITEM II	
SHEET	TITLE
M-EMP 0/7.1	PROJECT LOCATION, DRAWING INDEX, SITE AND VICINITY MAP
M-EMP 1/9	GENERAL SITE PLAN
M-EMP 1/11.1	ELLIS ISLAND SHEET PILE STORAGE AREA MAP
M-EMP 7/56	LEVEE PLAN
M-EMP 7/57.2	PUMP STATION AT SITE #1 EXCAVATION AND GRADING PLANS
M-EMP 7/58.1	PUMP STATION AT SITE #1 PLAN AND SECTION
EMP 7/59.2	SITE #2 EXCAVATION AND GRADING PLANS
M-EMP 7/60.1	SITE #2 PUMP STATION & GRAVITY STRUCTURE ENLARGED SITE PLAN
M-EMP 7/61.1	SITE #2 GRAVITY STRUCTURE & PUMP STATION SECTIONS
M-EMP 7/62.1	SITE #3 EXCAVATION AND GRADING PLANS
M-EMP 7/63.1	SITE #3 EXCAVATION AND GRADING ENLARGED SITE PLAN
M-EMP 7/64.1	SITE #3 GRAVITY STRUCTURE SECTIONS AND STAFF GAGE DETAILS
M-EMP 7/65	SITE #1, #2, #3 CHANNEL PROFILES
M-EMP 7/66	SITE #1, #2, #3 LEVEE PROFILES
M-EMP 7/67.1	TYPICAL SECTIONS AND DETAILS
M-EMP 7/68	LEVEE PLAN STA 179+00 TO STA 180+09
M-EMP 7/69	LEVEE PROFILE STA 179+00 TO STA 180+09
M-EMP 7/70P	HARDPOINT STRUCTURES AT SITES #1 & #2 SECTION & PROFILE
M-EMP 91/17.2	SITES 2 & 3 GRAVITY STRUCTURES ELEVATIONS, NOTES

SWAN LAKE HABITAT REHABILITATION AND PUMPING ITEM II Continued	
M-EMP 91/18.2	SITES 2 & 3 GRAVITY STRUCTURES PLAN, SECTIONS AND DETAILS
M-EMP 91/19	SITES 2 & 3 BRIDGE DECK SLAB SECTIONS, DETAIL, NOTES
M-EMP 91/20.1	SITES 2 & 3 GRAVITY STRUCTURES BRIDGE GUARDRAIL AND FRP HANDRAIL DETAILS
M-EMP 91/21.1	SITE 3 GRAVITY STRUCTURE BRIDGE ABUTMENTS PLANS, ELEV., SECTIONS & DETAILS
M-EMP 91/22.1	SITE 2 GRAVITY STRUCTURE BRIDGE ABUTMENTS PLAN, ELEVS., SECTIONS & DETAILS
M-EMP 91/23.1	SITE 2 & 3 STOPLOG SUPPORT SYSTEM – ELEVATION, SECTIONS AND DETAILS
M-EMP 91/24.1	SITE 2 & 3 STOPLOG SUPPORT SYSTEM SECTIONS, & DETAILS
M-EMP PLATE 1	TIMBER STOPLOG FISH PASSAGE FRAME
M-EMP 91/26	SITE 2 & 3 GRAVITY STRUCTURES 7 AND 3 TIMBER STOPLOG ELEV., SECTIONS, AND DETAILS
M-EMP 91/27.2	SITE 2 & 3 TROLLEY SUPPORT SYSTEM – ELEVATIONS AND SECTIONS
M-EMP 91/28.1	SITE 1 & 2 PUMP STATIONS PRECAST VAULTS –PLANS, SECTIONS, DETAILS AND NOTES
M-EMP 91/29.2	SITE 1 & 2 PUMP STATIONS PRECAST VAULTS ELEVATIONS, DETAILS
M-EMP 91/30.1	SITE 1 & 2 PUMP STATIONS PUMP LAYOUT AND DETAILS
M-EMP 91/31	SITE 2 & 3 GRAVITY STRUCTURES STOP LOG PICK UP BEAM ELEVS., SECTION AND DETAILS
M-EMP 98/15	SOIL AND ROCK LEGEND
M-EMP 98/16	BORING LOGS
M-EMP 99/10	GRAFTON, ILLINOIS STAGE HYDROGRAPH
M-EMP 99/11	GRAFTON, ILLINOIS STAGE HYDROGRAPH

SWAN LAKE HABITAT REHABILITATION ITEM III	
SHEET	TITLE
M-EMP 016	PROJECT LOCATION, DRAW INDEX, SITE MAP AND VICINITY MAP
M-EMP 1/6	GENERAL SITE PLAN
M-EMP 1/7	GENERAL SITE PLAN
M-EMP 1/8.1	GENERAL SITE PLAN
M-EMP 7/33.1	LEVEE PLAN
M-EMP 7/34	LEVEE PLAN
M-EMP 7/35	LEVEE PLAN
M-EMP 7/36	LEVEE PLAN
M-EMP 7/37	LEVEE PLAN
M-EMP 7/38.2	LEVEE PLAN
M-EMP 7/39	UPPER BOAT LAUNCH AND ACCESS ROAD PLAN

SWAN LAKE HABITAT REHABILITATION ITEM III Continued	
M-EMP 7/40	LOWER BOAT LAUNCH AND ACCESS ROAD PLAN
M-EMP 7/41	ENTRANCE ROAD PLAN AND INTERSECTION DETAIL
M-EMP 7/41A	ENTRANCE ROAD PLAN
M-EMP 7/42.1	ENTRANCE ROAD AND LEVEE PROFILE STA-6+14.42 TO STA 93+00
M-EMP 7/43.1	LEVEE PROFILE STA 93+00 TO STA 195+00
M-EMP 7/44.1	LEVEE PROFILE STA 195+00 TO STA 297+00
M-EMP 7/45	LEVEE PROFILE STA 297+00 TO STA 334+37.95 AND BOAT LAUNCH ACCESS ROAD PROFILES
M-EMP 7/46	CHANNEL NO 1 PROFILE STA 0+00 TO STA 100+00
M-EMP 7/47	CHANNEL NO 1 PROFILE STA 100+00 TO STA 200+00
M-EMP 7/48.1	CHANNEL PROFILE NO 1 STA 200+00 TO STA 300+0
M-EMP 7/49	CHANNEL NO 1 PROFILE STA 300+00 TO STA 324+08 CHANNELS NO 1A, 2, & 2A PROFILES
M-EMP 7/50	CHANNELS NO 3, 4, 4A PROFILES
M-EMP 7/51	CHANNEL NO 2 LOWER AND UPPER BARRIER ISLANDS PROFILES
M-EMP 7/52	INTERIOR CLOSURE PROFILE AND CHANNEL NO 4 LOWER/UPPER BARRIER ISLANDS PROFILE
M-EMP 7/53.1	INTERIOR CLOSURE DRAINAGE STRUCTURE PLANS AND SECTIONS
M-EMP 7/54.1	MISCELANEOUS SECTIONS AND DETAILS
M-EMP 7/55.2	MISCELLANEOUS SECTIONS AND DETAILS
M-EMP 98/12	BORING LEGEND
M-EMP 98/13	GEOTECHNICAL BORING LOGS
M-EMP 98/14	GEOTECHNICAL BORING LOGS
M-EMP 99/8	GRAFTON, ILLINOIS STAGE HYDROGRAPH
M-EMP 99/9	GRAFTON, ILLINOIS STAGE HYDROGRAPH

SWAN LAKE LOWER COMPARTMENT PUMPSTATIONS MODIFICATIONS	
SHEET	TITLE
GI002	PROJECT LOCATION AND VICINITY MAP
GI003.1	ABBREVIATION LIST, LEGEND, AND DRAWING INDEX
GR601	SOIL BORING LOGS
VH601	STAGE HYDROGRAPHS SHEET 1
VH602	STAGE HYDROGRAPHS SHEET 2
C-101	CIVIL EXISTING PLAN AND PROFILE
C102.1	CIVIL SITE PLAN
C-103.1	CIVIL ENLARGED SITE PLAN
C-301.1	CIVIL SECTIONS SHEET 1
C302.1	CIVIL SECTIONS SHEET 2
S-001	STRUCTURAL GENERAL NOTES
S-101.1P	STRUCTURAL SITE PLAN
S-102.1P	STRUCTURAL ENLARGED PLAN (NORTH)
S-103.1P	STRUCTURAL ENLARGED PLAN (SOUTH)
S-104	STRUCTURAL ENLARGED PLAN

SWAN LAKE LOWER COMPARTMENT PUMPSTATIONS MODIFICATIONS CONTINUED	
S-201.1	STRUCTURAL SHEET PILE ELEVATIONS
S-202.1P	STRUCTURAL GATE STRUCTURE ELEVATIONS
S-203P	STRUCTURAL SHEET PILE ELEVATIONS AND DETAILS
S-504	STRUCTURAL GATE STRUCTURE DETAILS SHEET 1
S-505	STRUCTURAL GATE STRUCTURE DETAILS SHEET 2
S-506.1	STRUCTURAL GATE STRUCTURE DETAILS SHEET 3
S-508	STRUCTURAL HOIST BEAM DETAILS
S-509	STRUCTURAL PORTABLE PUMP SITE DETAILS
M-201	MECHANICAL SLIDE GATE DETAILS
M-202	MECHANICAL FISH SCREEN DETAILS
M-501	MECHANICAL PORTABLE PUMP SITE DETAILS SHEET 1
M-502	MECHANICAL PORTABLE PUMP SITE DETAILS SHEET 2

SWAN LAKE HABITAT REHABILITATION AND ENHANCEMENT PROJECT LOWER COMPARTMENT PUMP STATION	
SHEET	TITLE
M-EMP-4 G-1	VICINITY MAP
M-EMP-4 G-2	SWAN LAKE PROJECT LOCATION
M-EMP-4 G-3.1	ABBREVIATION LIST, LEGEND AND DRAWING INDEX
M-EMP-4 C-1	SWAN LAKE SURVEY CONTROL APPROACH AND DISCHARGE PLAN AND PROFILE
M-EMP-4 C-2	SWAN LAKE SITE PLAN
M-EMP-4 C-3.1	SWAN LAKE SECTION STATION 61+65
M-EMP-4 C-4	TYPICAL SECTIONS
M-EMP-4 S-1.1	GENERAL STRUCTURAL NOTES
M-EMP-4 S-2.1	SWAN LAKE PUMP STATION SITE PLAN
M-EMP-4 S-X3.1	SWAN LAKE PUMP STATION SECTIONS
M-EMP-4 S-4.1	SWAN LAKE PUMP STATION DETAILS
M-EMP-4 S-5.1	STANDARD DETAILS SHEET 1
M-EMP-4 S-5A.1	STANDARD DETAILS SHEET 2
M-EMP-4 S-6.1	STANDARD DETAILS SHEET 3
M-EMP-4 S-7.1	MISCELLANEOUS DETAILS
M-EMP-4 S-71.1	SWAN LAKE PUMP STATION DETAILS

APPENDIX C - PROJECT INSPECTION CHECKLISTS

DATE _____ TIME _____		EMP - HREP OMR&R INSPECTION																		PG	OF			
ANNUAL __ FLOOD EVENT __		CALHOUN POINT SITE _____																		ESTIMATED COSTS (\$000'S)				
PROJECT FEATURE	LOCATION	MANAGEMENT PLAN																						
		OPERATIONS & MAINTENANCE					STAFF			FISH / W/LDLIFE MGMT				HABITAT MGMT			TRESPASS							
		PROGRAM	FLOOD RESPONSE	SEDIMENT CONTROL	WATER CONTROL		MAINTENANCE	ENFORCEMENT		FISHERIES	RESIDENT	MIGRATORY		AQUATIC	FOREST WETLAND	HERBACEOUS WETLAND	PLANTINGS	ACCESS CONTROL	ENCROACHMENT		ANNUAL MAINT	MAINT TO SAT CONDITION	R/F TO SAT CONDITION	
MANAGEMENT PLAN																								
REMARKS:																					IMAGES:			
PERSONNEL ATTENDING:												INSPECTOR:												

DATE _____ TIME _____
 ANNUAL __ FLOOD EVENT __

EMP - HREP OMR&R INSPECTION

PG ____ OF ____

CALHOUN POINT SITE _____		STRUCTURES													ESTIMATED COSTS (\$000'S)				
PROJECT FEATURE	LOCATION	CONCRETE						CULVERTS					ACCESS FACILITIES		ANNUAL MAINT	MAINT TO SAT COND	R / R TO SAT COND		
		FLOOD WALLS	HEADWALLS	APRONS	SURFACES	FOUNDATIONS	STOP LOSSES	BREAKS / HOLES	DEBRIS	GATES	STAFF GAGES	ROADWAYS	PARKING LOTS	BOAT RAMPS				GATES	
REMARKS:																	IMAGES:		
PERSONNEL ATTENDING:									INSPECTOR:										

DATE _____ TIME _____
 ANNUAL _ FLOOD EVENT _

EMP - HREP OMR&R INSPECTION

PG _____ OF _____

CALHOUN POINT SITE _____		LEVEE EMBANKMENTS								RIPRAP / REVETMENT					CHANNELS / FLOODWAYS			ESTIMATED COSTS (\$000'S)			
PROJECT FEATURE	LOCATION	DEPRESSIONS	SURFACE EROSION	SLOPE STABILITY	ANIMAL BURROWS	VEGETATION / TURF	ENCROACHMENTS	DEBRIS	ROADWAYS	R/S SLOPES	L/S SLOPES	R/S TOES	L/S TOES	CHANNEL BANKS	CAPACITY	EROSION			ANNUAL MAINT	MAINT TO SAT CONDITION	R/R TO SAT CONDITION

REMARKS:	IMAGES:

PERSONNEL ATTENDING:	INSPECTOR:

DATE _____ TIME _____
ANNUAL _ FLOOD EVENT _

EMP - HREP OMR&R INSPECTION

CALHOUN POINT SITE _____		PUMPING PLANTS																ESTIMATED COSTS (\$000'S)																					
PROJECT FEATURE	LOCATION	PUMPS			POWER				LUBRICANTS			CONTROL SYSTEMS			PIPES / GATES			SUMPS	ANNUAL MAINT	MAINT TO SAT COND	R/I TO SAT COND																		
		MOTORS	ENGINES		DIESEL	ELECTRIC	PORTABLE		OIL	OTHER		SWITCHGEAR	MOTOR	ENGINES		EMBEDDED METALS	TRASHRACKS					GATES																	

REMARKS:

IMAGES:

PERSONNEL ATTENDING: _____

INSPECTOR: _____

APPENDIX D - FINDING OF NO SIGNIFICANT IMPACT (FONSI)

APPENDIX D- FINDING OF NO SIGNIFICANT IMPACT (FONSI)

16. FINDING OF NO SIGNIFICANT IMPACT

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM

SWAN LAKE HABITAT REHABILITATION AND ENHANCEMENT PROJECT POOL 26, ILLINOIS RIVER, CALHOUN COUNTY, ILLINOIS

(1) I have reviewed and evaluated the documents concerning the proposed rehabilitation and enhancement of Swan Lake.

The purpose of the project is to rehabilitate and enhance wetland habitat at Swan Lake for both migratory waterfowl and fish. This is to be done by reducing sediment deposition from river flooding and hillside runoff, by controlling interior water levels, and by reducing wind generated wave action. The project would be funded under the provisions of Public Law 99-662.

(2) Prior to my decision, I evaluated other pertinent data and information which addresses the various practicable alternatives. As part of that evaluation, I considered:

- a. the "No Action" alternative,
- b. a "Wetlands Excavation" alternative,
- c. the proposed or recommended plan, referred to as the "Wetlands Protection" alternative, and
- d. various alternative component features leading to the recommended plan (e.g., various dike and levee heights and alignments, various hillside sediment control programs, etc.).

(3) These alternatives have been studied, and major findings of this investigation include the following:

a. The "No Action" alternative was evaluated but subsequently rejected. This alternative would do nothing to address study objectives relating to sedimentation control, water level control, bottom solidification, wave control, management unit subdivision, deep water needs, and cold water buffering.

b. The "Wetlands Excavation" alternative was also found to be unacceptable. It would not alter future sedimentation, it would not provide a means of regulating water levels, it would not allow for bottom solidification, wave control, management unit size reduction, nor would it provide the ability to buffer the river's cold water effects during the winter and spring. The plan would provide a short-term increase in deepwater habitat, and would provide short-term fish access/passage.

c. The "Wetlands Protection" alternative represents an innovative approach to wetlands management and was found to be fully responsive to the project objectives, and was designated as the Selected Plan. Most importantly, it would greatly reduce the sedimentation rate, it would provide: a reliable means of water control, a means of periodically resolidifying the lake bottom, and a means of reducing wave action. It would subdivide the lake into smaller management units, it would provide limited deep water habitat for wintering fish, it would provide opportunity for fish movement during the fall, it would buffer cold water effects on wintering fish, and it would provide alternate structures so as to assure fish passage. Specific options considered in detail included: dike/levees, lake closures, water control/fish passage structures, hillside sediment control structures, dredging, and islands creation.

(4) The possible consequences of the recommended plan have been studied for physical, environmental, cultural, social and economic effects. Major conclusions of this study are as follows:

a. The construction of the project represents a permanent change in the topographic and hydrographics of the Swan Lake area. These changes are necessary for water, sediment, and wave control.

b. The project is in compliance with the requirements of the Clean Water Act Section 404(b)(1) guidelines. State water quality certification under Section 401 has been received. The proposed project would likely have minimal adverse impacts on water quality.

c. No project effects are expected on upstream river elevations during floods. Any project induced bank erosion is expected to be minimal.

APPENDIX D- FINDING OF NO SIGNIFICANT IMPACT (FONSI)

d. There would be a major benefit to waterfowl and fish. The project would result in an estimated net gain of +1,021 non-forested wetland average annual habitat units (AAHU's) for waterfowl and +669 AAHU's for fish. To make these non-forested wetland benefits possible, a total of 95 acres of forested wetland would have to be cleared as part of project construction.

e. A professional archaeologist would monitor construction activities for the presence of archaeological remains. If such remains are found, construction will be postponed until an archaeological investigation is conducted.

f. Fishing at Swan Lake proper and hunting at Fuller Lake is expected to improve as a result of project habitat improvements. A loss of direct access to Swan Lake by fishermen from the Illinois River is partly offset by the inclusion of two west lake shore boat access areas.

g. It is anticipated that the proposed action will have little or no adverse impact on air quality, noise, socioeconomic resources and aesthetics.

h. A loss of 33 acres of prime farmland will occur as a result of the project.

i. No Federally listed endangered species will be adversely affected by the proposed action.

(5) Based on my analysis and evaluation of the alternative courses of action presented in the Environmental Assessment, I have determined that the rehabilitation and enhancement of Swan Lake will not have major adverse environmental effects, but will have important beneficial effects on the quality of the environment. Therefore, No Environmental Impact Statement will be prepared prior to proceeding with this action.

15 Jan 93
Date

Richard Smith - Major Act CE
for James D. Craig
Colonel, U.S. Army
District Engineer

APPENDIX E – INDEX OF MANUFACTURER’S O&M MANUAL

Note: The following are of principle interest for OMRR&R purposes. Complete manuals are located on the CD furnished as part of this manual. Hard copies of the drawings are not provided but may be printed from the CD.

ITEM	
Swan Lake Item I Contract	
	Drawings
Swan Lake Item II Contract	
	Drawings
	Coating Specifications
	Enclosed Gear Pedestal Lifts – Models CPE-2 and CPE-4
	Hydro Gate Corporation Calculations
	Diamond Vogel Paints Production Information
	Transmittal Records
	Installation, Operation, Maintenance, and Training Manual for Hydro Sluice Gates (Heavy Duty Series)
	Maintenance and Operating Instructions for Portable Hydraulic Gate Actuator
	Operations, Installation, and Maintenance Specifications for Model “PR10” Torque Limiter
	Installation, Operation, and Maintenance Manual for Hydro Gate Medium and Heavy Duty Flap Gates
Swan Lake Item III Contract	
	Operation and Maintenance Manual for Canal Gate
	Detail Drawings
	Engineering Drawings
Swan lake Lower Compartment Pump Station Modifications Dry Prime Centrifugal Pump and Engine	
	Transmittals
	Purchase of Godwin Model CD250M Diesel Driver Pumpset Submittals
	Standard Godwin Specifications
	Pump Engine General Specification
	Pump Engine Operations Manual
	Pump General Specifications
	Pump and Engine Operations and Maintenance
	Prime Guard Controller General Specifications
	Primeguard Control Operations and Maintenance
	Pump Certified Operating Conditions
	Diesel Fueled Engine Pump Drivers

Swan Lake Lower Pump Station Modifications O&M information	
	Transmittal
	Transmittal Record
	Operating and Fueling Instructions
	Steel Slide Gate
	Medium and Heavy Duty Flap Gate
	Electric Operator
	Fish Screen Hoist
	Owner's manual for Honda Generator
	Godwin Pump Operating and Maintenance Manual
	John Deere Tier II Engine Operations Manual
Swan Lake Lower Pump Station Pump and Gear Drive O&M information	
	Transmittal
	Section I – Pump Lifting Instructions
	Section II – Pump Station Layout Drawing
	Section III – Installation Instructions
	Section IV – Oil Reservoirs Instructions
	Section V – Bolt Torque Valves
	Section VI – Guide to Locating Trouble
	Section VII – Disassembly Instructions
	Section VIII – Maintenance Data Sheets for Pump and Gear Drive
	Section IX - Furnished Spare Parts List
	Section X – Pump Performance Test Curve
	Section XI – Cascade Standard Limited Warranty
	Section XII – De'Ran Gear, Inc. Data and Manual
	Section XIII – Pump sectional drawing

APPENDIX F - ACRONYMS

CMP - Corrugated Metal Pipe

DA - Department of the Army

DPR - Definite Project Report

FONSI - Finding of No Significant Impact

GP - General Plan

GPM – Gallons per Minute

HREP – Habitat Rehabilitation and Enhancement Project

IDNR - Illinois Department of Natural Resources

IDOC – Illinois Department of Conservation

MOA - Memorandum of Agreement

NEPA - National Environmental Policy Act

NGVD - National Geodetic Vertical Datum

OEM - Original Equipment Manufacturer

RPM – Revolutions per Minute

SCS – Soil Conservation Service

UMRS-EMP - Upper Mississippi River System – Environmental Management Plan

UMRS-LTRM - Upper Mississippi River System –Long Term Resource Monitoring Program

USACE - United States Army Corps of Engineers

USFWS - United States Fish and Wildlife Service

WMU - Water Management Unit

WRDA - Water Resources Development Act